DEVELOPMENT OF 65% DACRON / 35% VISCOSE TROPICAL FABRIC AND UNIFORM

U. S. NAVAL SUPPLY RESEARCH AND DEVELOPMENT FACILITY
BAYONNE, N. J.

ALL PHOTOGRAPHS
CONTAINED HEREIN
ARE
OFFICIAL NAVY PHOTOGRAPHS
UNLESS OTHERWISE NOTED

U. S. Naval Supply Research and Development Facility
Clothing and Textile Division
Bayonne, N.J.

Clothing and Textile Division Report No. 55

Development of 65% Dacron/35% Viscose Tropical Fabric and Uniform

Judith Steelman

Task No. NT-F015-14-004.03(4)

Captain Herman Strock, SC, USN
Officer in Charge

February 1962

ABSTRACT

The development of a 65% Dacron/35% viscose rayon tropical fabric is described. Its general fabric properties, appearance retention, and tailoring properties are compared to 100% wool tropical worsted and a previously developed 50% Dacron/50% viscose rayon tropical. Also discussed are patterns, components, and fabrication in relation to 65% Dacron/35% viscose tropical fabric; related specifications; and initial procurement and issue of uniforms.

CONCLUSIONS AND RECOMMENDATIONS

The 65% Dacron/35% viscose tropical is superior in wet crease retention, wet wrinkle recovery, and strength to either the 50/50 blend or 100% wool fabric. It is tailorable, economical, and conserves wool one hundred percent. Specification requirements for it have been incorporated in Military Specification, Cloth, Tropical, MIL-C-21115, 15 October 1957.

Patterns were adjusted according to the needs of the fabric. Components were modified to reduce the differential shrinkage between the outer fabric and components for an acceptable dry cleanable garment. Specification requirements for the fabrication of the uniform with 65/35 blend have been established, namely, Purchase Description Uniform Man's (Service Khaki) (Dacron 65/viscose 35), 12 November 1956. The initial procurement of uniforms confirmed many phases of the purchase description and tailorability of the fabric. The issue of the uniforms confirmed the patterns and indicated that the garments were comfortable and maintained a superior appearance during wear.

The development of a tailored uniform made with 65% Dacron/35% viscose blend fabric indicates the problems that would be encountered with similar synthetic blend fabrics. Some of the components such as the collar cloth and lining still pose a problem due to differential shrinkage. Further study is recommended to develop more stable components, preferably of synthetic fibers, to facilitate fabrication and improve utility and appearance of the uniform. The possibility of developing a completely wash and wear garment should also be considered.

DEVELOPMENT OF 65% DACRON/35% VISCOSE TROPICAL FABRIC AND UNIFORM

INTRODUCTION

As part of a program for the conservation of potentially critical textile materials, the Navy is considering the possibility of conserving wool. Principal methods for conservation are reduction of weight, improvement of durability, and incorporation of synthetics into fabrics. The first two methods were applied in the development of a 22-ounce melton (1) as replacement for 30-ounce kersey. Methods two and three and, to a limited degree, method one lend themselves to a relatively lightweight fabric. The use of proper synthetic fiber in a tropical suiting fabric offers special promise for improving other desirable properties. Industry,too, has been aware of the potential of blends in lightweight, appearance-retaining summer garments. Commercially, the use of blend fabrics in summer wear has become a very important factor. In addition to the need to conserve wool, there was also the desire to reduce wrinkling under warm-moist conditions, and to impart improved strength and launderability to the fabric.

An orientation study (2) was carried out which included tropical fabrics of wool, Dacron, Dacron blended with wool in 55/45 proportion, and Dacron combined with viscose in a 50/50 blend. Of the latter blend, one piece was treated with a crease-resistant finish and one with a water-repellent and crease-resistant finish (WCR). A service evaluation of two years was then conducted on uniforms made with these fabrics. During the evaluation the garments were examined periodically.

Results of this study can be summed up as follows: The tropical worsted fabric had the lowest durability, wet wrinkle recovery, and wet

crease retention properties. The 100% Dacron fabric had high burn hole incidence, high cost, and the highest durability, wet wrinkle recovery, and wet crease retention. Dacron/wool fabric was second highest in burn hole incidence, appearance retention properties, cost, and could not be dyed in a uniform shade of khaki. The Dacron/viscose fabric showed lowest burn hole incidence among the experimental fabrics, was durable, most economical, generally looked promising, and resulted in the maximum conservation of wool.

Fifty-six percent of the 100% Dacron uniforms and 45% of the Dacron/wool garments showed burn holes. One hundred percent of the Dacron/wool and Dacron/viscose WCR garments showed pilling and indicated a need for improved finishing to control this variable.

The tropical worsted fabric had the best tailoring properties followed, in order, by Dacron/viscose, Dacron/wool, and 100% Dacron.

Although the 50/50 blend of Dacron and viscose looked promising, its wet crease retention and wrinkle recovery, factors that contribute to maintenance of good appearance, were not as high as desired. In order to improve these properties, it appeared that a higher Dacron content would be necessary because of its high elastic recovery and stiffness and low moisture absorbency.

Preliminary work in the fabrication of uniforms with 50% and 65% synthetic blends indicated the need to revise the traditional patterns, components, and sewing techniques. With all wool fabrics, pressing is used to supplement the shaping of the garment; however, this cannot be done with blend fabrics that have a substantial amount of synthetic fiber because of the low shrinkage and stretch of the fabric. Therefore, since the Navy requires uniforms to be form fitting, adjustments had to be made in the pattern. Industry minimizes such problems by using blend fabrics in loose straight-styled coats (jackets). Standard components used in a khaki uniform have

more shrinkage than the outer blend fabric, requiring a modification of the components. It was also observed that in order to minimize puckering at the seams, adjustments had to be made in the sewing of the garment.

Based on these preliminary studies, work was initiated to develop a utility fabric that would have an optimum Dacron content, to modify patterns and components, to fabricate commercially a small lot of uniforms, and to conduct an appropriate service trial.

FABRIC DEVELOPMENT

Based on the earlier studies on blend tropical fabrics (2) and the known properties of the Dacron fiber, it appeared that a 65% Dacron content blended with viscose would be more suitable for Navy needs. A blend fabric of this kind should have better appearance retention properties, as well as more durability and dimensional stability than the 50/50 blend. Also, it should tailor better, have a lower burn hole incidence, and be less expensive than 100% Dacron fabric. After preliminary confirmatory experiments, a small trial procurement of the desired fabric was made commercially. The blend included $4\frac{1}{2}$ denier Dacron to give the fabric a firmer hand and better resilience. The fabric was also given a spot-resistant finish to improve the moisture resistivity of the rayon.

Two other types of tropical fabrics are used in this report for comparison with the 65/35 fabric. One is the 50% Dacron/50% viscose with WCR finish (2), and the other is the standard 10.5-ounce tropical worsted fabric (3).

TEST METHODS

The following tests were performed in accordance with Federal Specification Textile Test Methods CCC-T-191b:

1. Physical Tests
   a. Breaking Strength, Grab, Method 5100.
   b. Laundering of Cloth, Cotton Mobile, Method 5556.
   c. Laundering of Cloth, Wool Mobile, Method 5556.
   d. Permeability to Air, Frazier, Method 5450.
   e. Pilling, Appearance Retention of Cloth, Method 5310.
   f. Shrinkage, Relaxation; Wool Cloth, Method 5558.
   g. Stiffness of Cloth, Drape and Flex, Method 5206.
   h. Tearing Strength, Elmendorf, Method 5132.

2. Colorfastness Tests

a. Crocking, Direct Comparison, Method 5650.

b. Dry Cleaning, Wet, Method 5622.

c. Laundering, Method 5610.

d. Light, Method 5660.

e. Perspiration, Method 5680.

f. Weather, Method 5670.

3. Appearance Retention Tests

The following tests were devised to measure the wet wrinkle recovery and crease retention properties:

a. Wet Wrinkle Recovery Test: - 6" by 3" samples were cut with the long direction parallel to the filling. They were joined across the warp ends with the face out by stitching at the open edge in the filling-wise direction 3/16" from the edge, being careful not to crease or handle the center portion of the sample. A fine nylon thread and a large stitch, 6 to 7 per inch, were used in the sewing of the seam. Five test specimens 5/8" by 1-1/2" were cut from the strip. Each one, held individually by a pair of tweezers at the sewn edge, was dipped in a .06% solution of Deceresol OT. The wet specimens were then placed on a 6" by 6" blotter and covered with another blotter. Enough pressure was applied to absorb the excess moisture. The specimens were then placed between two 6" by 6" glass plates and one pound of pressure per sample was applied for ten minutes. The stitching was cut off and the specimens, now "V" shaped, were relaxed on edge on pinboards for 60 minutes. The included angles were measured on the Monsanto Wrinkle Recovery Tester. The degree of angle was then converted to percent recovery. A fabric with 100% recovery would return to a complete flat unwrinkled condition.

b. Wet Crease Retention Test: - A 6" by 1-1/2" seamed tube of fabric was prepared as described in the Wet Wrinkle Recovery Test. It was then pressed on a hot head press that had an approximate bed temperature of 270°F, using 40 pounds of steam pressure, as follows: pre-steam one second, lock head one second, dry three seconds, cool 15 seconds. The pressed strip of fabric was then conditioned. Five test specimens 5/8" by 1-1/2" were cut from the strip and the stitching was removed. The specimen ends were held closed by a pair of tweezers and then dipped into a .06% solution of Deceresol OT. They were then opened up and placed on a 6" by 6" blotter and covered with another blotter. The blotters with the samples were then placed between two 6" by 6" glass plates and one pound of pressure per sample was placed thereon for five minutes. The specimen "V"s were then placed on edge on pinboards and relaxed for 60 minutes. The reading of the included angle was taken on the Monsanto Wrinkle Recovery Tester. Values were calculated on the basis of a completely closed "V" having a wet crease retention of 100%.

DISCUSSION

Table I shows a comparison of appearance retention properties of 65% Dacron/35% viscose, 50% Dacron/50% viscose, and 100% wool tropical fabrics. The test data show that the wet crease retention of the 65/35 blend fabric is over four times that of the all wool and 13% higher than that of the 50/50 blend fabric. The superior wat crease retention of the 65/35 fabric reflected itself in the acceptance of a better press than the 50/50 blend fabric during tailoring into uniforms. That is, once a seam was pressed open, it remained open and flat. The findings also show that the wet wrinkle recovery of the 65/35 blend fabric is twice as high as the all wool

fabric and about the same as the 50/50 blend. These two fabric properties are chief contributors to keeping a garment neat in hot humid weather.

TABLE I

APPEARANCE RETENTION PROPERTIES

Tests	100% Wool T1a-3-5(a)	50% Viscose 50% Dacron D(a)	35% Viscose 65% Dacron T33(a)
Wrinkle Recovery, Wet, (%)	42	85	87
Crease Retention, Wet, (%)	14	55	62

(a) Laboratory identification numbers.

Table II shows a comparison of general fabric characteristics of the three fabrics. The 65/35 blend is lighter and much more air permeates through it than through either of the other two fabrics. This factor contributes to comfort when a garment of the 65/35 fabric is worn.

The breaking strength of the 65/35 tropical is considerably higher than that of the all wool fabric and 50/50 blend. The Elmendorf tear of the 65/35 fabric is also higher than that of either of the other two fabrics. These results show the superior strength of the 65/35 fabric and indicate that it will outlast the other two fabrics.

The pilling of the 65/35 blend fabric is slightly more than that of the all wool fabric but it is less than that of the 50/50 blend. Pilling is the formation of small balls out of surface fibers. Pills usually form in areas where there is wear between the fabric and body, or fabric and fabric, or fabric and another object, and detract from the appearance of the garment. Common areas of pilling are the inner side of the collar, the armpits, and the seat. Some pills are removed in dry cleaning.

The 65/35 fabric shows the lowest shrinkage of all three fabrics even after cotton laundering. As a result, a modification of patterns was required to compensate for this lack of shrinkage, as discussed later in this report.

TABLE II

GENERAL FABRIC CHARACTERISTICS

Characteristics	100% Wool	50% Dacron 50% Viscose	65% Dacron 35% Viscose
Count	54 x 49	59 x 50	57 x 50
Weight (oz./sq.yd.)	6.7	6.4	5.8
Air Permeability, Frazier ($ft.^3/min./ft.^2$)	35	56	137
Breaking Strength, Grab (lbs.)	55 x 50	100 x 77	149 x 122
Tear Strength, Elmendorf (lbs.)	3.3 x 2.9(a)	9.4(b) x 6.1(a)	10.4 x 8.5(b)
Stiffness, As Received (c)	1.23	1.97	1.5
Pilling (e)	None	Moderate	Low
Shrinkage %	2.3 x 1.6(f)	1.8 x 1.1(d)	.8 x .7(d)

(a) Standard instrument with augmenting weight.

(b) Heavy duty instrument with one augmenting weight.

(c) Geometric mean of warp and filling, in.-lbs. x 10^{-4}.

(d) After 1 cotton mobile laundering.

(e) Five square inch test area, 0.18 psi pressure, 7K Wear Disc for 10 cycles, followed by Pilling Disc for 5 minutes.

(f) After 1 wool mobile laundering.

Table III shows the comparative fastness properties of the three fabrics. The 50/50 blend fabric showed a slight break after 20 hours exposure to light

and a definite break after 40 hours. In each case the fabric assumed a pink cast. The 65/35 blend fabric also showed a very slight break after 20 hours exposure and a definite break after 40 hours, but the break was on shade. That is, the fabric became lighter in shade but retained the same tone. The breaks in shade of this fabric were comparable to that of the all wool fabric. Upon exposure to weather the fabrics showed similar behavior. In fastness to wet dry cleaning, perspiration, crocking, and laundering, all three fabrics showed good fastness.

TABLE III

COLOR FASTNESS PROPERTIES

Tests	100% Wool	50% Dacron/ 50% Viscose	65% Dacron/ 35% Viscose
Light, 20 hrs.	Slight break	Slight break)pink	Slight break
40 hrs.	Definite break	Definite break)cast	Definite break
Weather, 20 hrs.	Some color loss	Some color loss)pink	Some color loss
40 hrs.	Some color loss	Some color loss)cast	Some color loss
Dry Cleaning, Wet	good	good	good
Perspiration	good	good	good
Crocking			
Wet	good	good	good
Dry	good	good	good
Laundering	good	good	good

UNIFORM DEVELOPMENT WITH 65/35 BLEND FABRIC

The khaki service uniform to be made with the 65/35 blend tropical fabric is considered a representative tailored uniform to study the problems that might be encountered with synthetic fibers. Orientation work in the fabrication of uniforms with blend tropical indicated a necessity to make adjustments in the patterns, components, and sewing of the garment.

PATTERNS

Since the blend fabric had low shrinkage and give, adjustments were necessary in the standard patterns to compensate for these characteristics. Tropical worsted fabric, even after sponging, still has a certain amount of residual shrinkage and an inherent characteristic of give. In the pressing operation, with the presence of moisture (steam), heat, and pressure, the dimensions of a wool fabric can be changed, and the change remains in the fabric upon drying. Therefore, additional shaping is given a woolen garment by the many pressing operations, removing slight fullness in some instances and adding in others. The blend fabric had low shrinkage and give characteristics; therefore, all the shaping had to be incorporated in the patterns, removing excess fullness except at points of stress. Examples of some of the adjustments made are as follows: Width of front shoulder was increased by 3/16 of an inch to equalize the fullness in the back shoulder. The blouse (coat) was cut one size larger to eliminate points of stress. Circumference (fullness) of top and under sleeve was reduced by 5/16 of an inch. Seat and crotch in the back were made larger by 1/4 of an inch and crotch in the front by 1/8 of an inch in order to eliminate stress.

COMPONENTS

In choosing components to be used with the low shrinkage 65/35 fabric, it was necessary to consider the differential shrinkage between the outer fabric and the components, even for a dry cleanable garment. Otherwise, the first time the wearer of the uniform was caught in a rain or after the garment had been cleaned a few times, the inner components would shrink more than the outer fabric and cause puckering and distortion of the uniform.

The coat front is one of the critical components, as excessive shrinkage (in comparison with outer fabric) would cause distortion in the front of the garment. Sample garments were made with three types of coat fronts: 1. standard, cotton padding on cotton/wool/hair canvas; 2. Pellon(a), style no. 982, padding on standard canvas; 3. Pellon padding on Arello(b), style no. 2035, fabric. Basic properties of the standard canvas, Arello, and Pellon are given in Table IV. The dimensional stability, lower weight, and higher stiffness after laundering of the Arello are desirable properties for this end item. Uniforms with each of these coat fronts were wetted out and evaluated for differential shrinkage and general appearance. The uniform which showed best all around appearance was the one with Arello/Pellon coat front, and it was selected to be used with the Dacron/viscose tropical fabric.

(a) Pellon is the trade name of a non-woven fabric made with various combinations of nylon, rayon, and cotton. It is produced by Pellon Corp. of New York, N.Y.

(b) Arello is the trade name of a woven fabric made with an Arnel warp and a blend filling of Arnel and goat hair. It is produced by Puritan Looms of Philadelphia, Pa.

TABLE IV

SELECTED PROPERTIES OF SOME UNIFORM COMPONENTS

Characteristics	Standard Canvas	Arello #2035	Pellon #982	Standard Rayon Lining	Treated Rayon Lining
Weave	Plain	Plain	--	2/1 Twill	2/1 Twill
Count	47 x 37	45 x 40	--	--	--
Weight, oz./sq.yd.	6.1	5.3	3.6	--	--
Air Permeability, $ft.^3/min./ft.^2$	154	270	--	--	--
Shrinkage, % (a)	4.0 x .3	.4 x .6	5.5 x +.1	10.5 x 1.7	4.2 x 1.4
Stiffness, As Received (b)	3.8	3.4	--	--	--
Stiffness, After Laundering(a)	2.0	3.0	--	--	--
Breaking Strength, lbs.	74 x 39	44 x 43	13 x 32	--	--
Fiber Content, Warp	100% Cotton	Arnel	--	Viscose	Viscose
Filling	18% Hair 82% Wool	Arnel/goat hair	--	Viscose	Viscose
Thickness, inches, 0.1 psi	--	--	.061	--	--
Elongation, %	--	--	83 x 72	--	--

(a) One cotton mobile laundering.

(b) Geometric mean of warp and filling, in.-lbs. x 10^{-4}.

Another critical component is the lining. The standard lining is a rayon fabric with high shrinkage. Arrangements were made to stabilize this lining by application of a shrink-resistant resin. In this process, the lining was also subjected to overfeeding in the drying to relieve the tension on the fabric. A limited amount of the treated lining was received. As shown in Table IV, the treated lining retained appreciable shrinkage, but was considerably more stable than the untreated lining.

Sample garments stitched with cotton thread showed indications of puckering after dry cleaning. This indicated the need for a dimensionally stable thread such as nylon.

FABRICATION

Because of the high synthetic content of the blend fabric, special precautions were necessary in the fabrication of garments. Cutting of the garment should be accurate, because if one part is cut too long, the extra length can not be removed in pressing. To minimize puckering during the sewing operations, experience of industry has shown that the tension of the needle and bobbin threads should be adjusted to the lowest level that would give an acceptable stitch, and the machine should be adjusted to the minimum number of stitches per inch that would be considered acceptable in appearance. In addition, even feeding of fabric, fine chrome needles, fine tooth feed dogs, and a small throat plate hole would contribute to good sewing results.

Sample uniforms were made up concurrently with the 50/50 blend fabric and the 65/35 blend tropical, by the same manufacturer, to study the tailoring properties of the two fabrics. The fabrication of the samples was followed through, and it was observed that the 65/35 blend retained the press better than the 50/50 blend. Additional sample garments of 65/35 fabric were made

up by two other manufacturers to verify its tailorability; and since only a few garments were fabricated, the contractor changed only the needles and thread tensions. No particular difficulties were encountered.

SPECIFICATION AND ADOPTION

Based on the preliminary fabrication studies, the following purchase description was established for the fabrication requirements of the uniform: Uniform Man's (Service Khaki) (Dacron 65/viscose 35) 12 November 1956. The chief differences between the requirements of this specification and that of the traditional tropical (4) worsted uniform besides the outer fabrics were as follows: Arello/Pellon coat fronts, pre-shrunk components, and nylon thread throughout except as recommended in the proposed changes.

Performance, economy,and potential conservation of wool offered by the 65% Dacron/35% viscose tropical were considered satisfactory. Sample garments made up with this fabric were forwarded to the Permanent Naval Uniform Board and approved as an alternate for the standard tropical worsted khaki uniform. This fabric was incorporated into Military Specification, Cloth, Tropical, MIL-C-21115, 15 October 1957.

UNIFORM PROCUREMENT AND ISSUE

A trial procurement of approximately 500 uniforms was made with 65/35 blend fabric in accordance with the prepared purchase description except for some minor changes that were deemed necessary during manufacture. The modified pattern developed under the earlier studies proved satisfactory. Nylon thread was used for the most part for all machine stitching. Exceptions were felling because with nylon thread the machine skipped stitches, and such minor operations as buttonholes and bartacking. For hand felling, silk thread was used because nylon thread twisted and tangled. The treated standard rayon lining was used for a limited number of uniforms. It was difficult to work with, especially in the cutting, because it shifted. Untreated but preshrunk standard rayon lining was used for the balance of the garments. The coat fronts used were made with Pellon padding on Arello fabric. All other components of the coat front (haircloth, stays, and sheeting) were the standard ones that had been preshrunk. The design and contour of the coat front in other respects were standard. All other components of the uniforms were the standard components that had been preshrunk by the uniform contractor. The undercollar cloth still seemed to have excessive residual shrinkage in comparison with the outer fabric and required extra attention. The results were satisfactory but the extra handling was time consuming.

In general, the uniforms were fabricated by normal production line methods. This procurement confirmed the requirements of the purchase description and the tailorability of the fabric. Figure 1 shows one of the uniforms from this procurement.

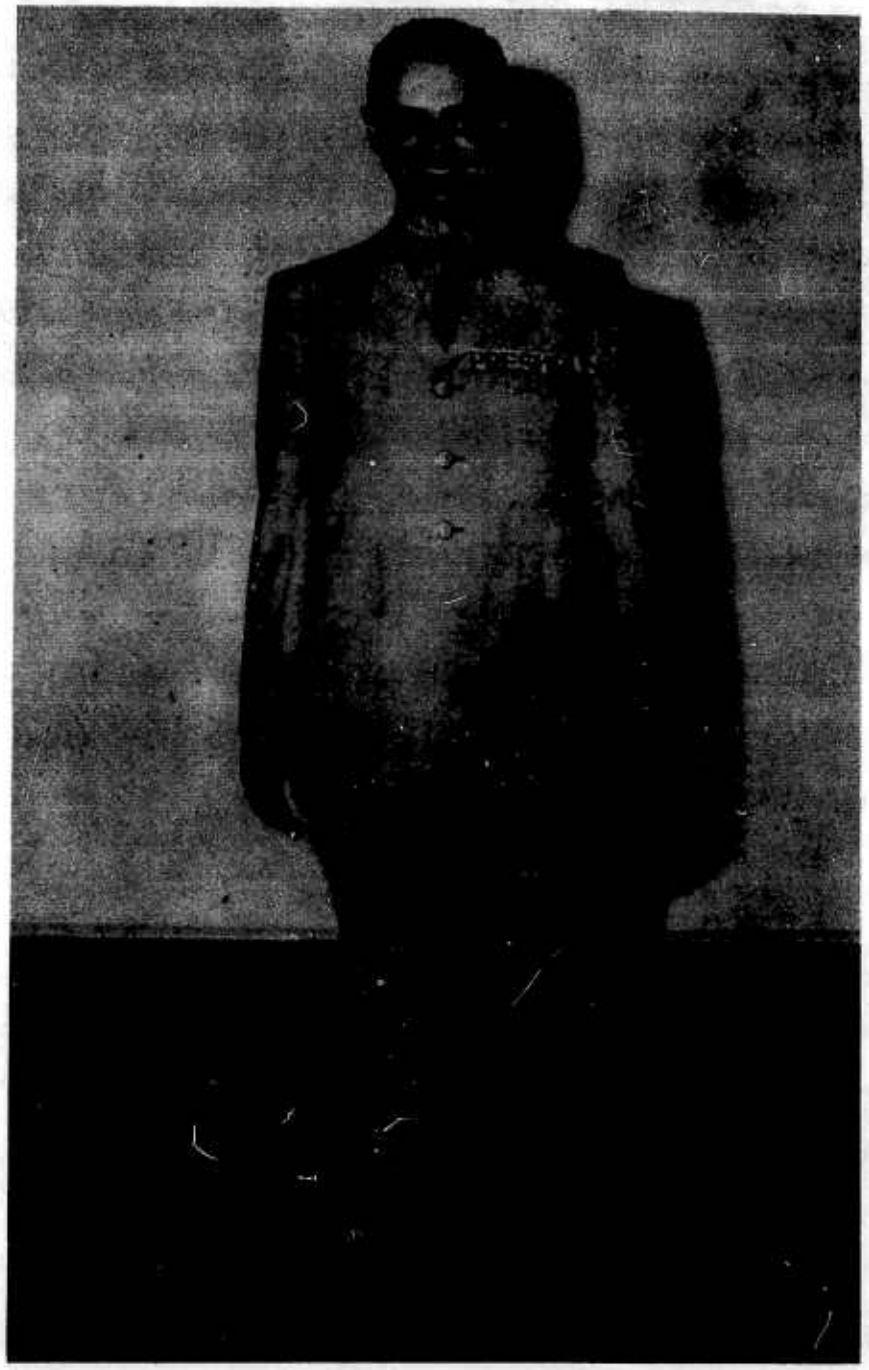

Figure 1. Uniform manufactured with 65% Dacron/35% viscose tropical fabric.

Four hundred and seventy-six of the uniforms were forwarded with questionnaires to the Naval Air Station in Pensacola, Florida, in June 1958, for initial issue to cadets. The garments were altered to individual requirements when issued. The tailor who made the necessary alterations reported that he had no difficulty in performing the necessary alterations on the uniforms, that the patterns used for the garments seemed satisfactory, and that the uniforms accepted a press well. Compilation of the comments of 150 questionnaires completed after an average actual wear period of 42 days is shown in Table IV. According to the data received, it is clear that most of the cadets liked the appearance and comfort of the uniform, and a majority preferred this uniform to the standard 100% wool uniform.

TABLE IV

COMMENTS ON INITIAL ISSUE OF 65% DACRON/35% VISCOSE UNIFORM

	Number	%
Average number of total days uniform was worn	42	--
Average number of times uniform was cleaned	13	--
Number of Cadets to whom uniform was issued	150	100
Appearance of uniform liked by	138[a]	93
Uniform felt comfortable to	144[a]	97
Its overall appeal in comparison with standard uniform (based on 140 replies)[b]		
was liked better by	75	54
was liked as well	53	38
total acceptance	128	91+

(a) One cadet's remarks were cancelled because he appraised uniform solely on fit.

(b) Ten cadets made no comments because they had not worn a standard uniform.

REFERENCES

(1) Press, J.J. Development of a Replacement for the Enlisted Men's Overcoat Fabric, Parts I, II, III and IV. Bureau of Supplies and Accounts (25 July 1952, 8 September 1952, 16 September 1952, 6 March 1953).

(2) Press, J.J. The Laboratory and Service Evaluation of Synthetic Tropical Fabrics, BUSANDA Reports Control Symbol 3950-2, (19 August 1954).

(3) Military Specification, Cloth, Tropical MIL-C-21115, 15 October 1957.

(4) Military Specification, Uniform, Man's (Service, Khaki) MIL-U-16340B(S&A) 19 May 1953.

DISTRIBUTION LIST

Report No. 55

"Development of 65% Dacron/35% Viscose Tropical Fabric and Uniform"

DEPARTMENT OF DEFENSE

Director
Office of Fuels, Materials and Ordnance
Office of the Director
Defense Research and Engineering

Office of Standardization
Armed Forces Supply Support Center
Attn: Mr. R. Norris

Commander, ASTIA (10 copies)
Arlington Hall Station
Arlington 12, Virginia
Attn: TIPDR

DEPARTMENT OF THE NAVY

Chief of Naval Operations (OP-07T10)

Chief of Naval Operations (OP-07)

Chief of Naval Operations (OP-702J)

Chief of Naval Operations (OP-403D)

Chief of Naval Material (MO-7)

Chief, Bureau of Naval Weapons (RAAE)

Chief, Bureau of Ships (342)

Commanding Officer
U.S. Navy Clothing and Textile Office
2800 South 20th Street
Philadelphia 1, Pa.

Commandant of the Marine Corps (A04D)
Washington 25, D.C.
Attn: H. N. Smith

Chief of Naval Personnel (Pers-Be)

Commanding General (970)
Marine Corps Supply Activity
1100 South Broad Street
Philadelphia 46, Pa.

Commanding Officer
Office of Naval Research
346 Broadway
New York 13, N.Y.
Attn: Mr. P. Schneider
Patents Branch

Commander
U.S. Naval Air Material Center
Naval Base
Philadelphia, Pa.
Attn: Air Crew Equipment Laboratory (1 copy)
and
Textile Laboratory (1 copy)

DEPARTMENT OF THE AIR FORCE

Commander
Hqs. Air Research and Development Command
Andrews Air Force Base, Maryland
Attn: Library

Headquarters
Aeronautical Systems Division
Air Force Systems Command
Wright-Patterson Air Force Base
Dayton, Ohio
Attn: Clothing Branch
or
Materials Laboratory

DEPARTMENT OF THE ARMY

The Quartermaster General
Department of the Army
Washington 25, D.C.

Executive Director (5 copies)
Defense Clothing and Textile Supply Center
2800 South 20th Street
Philadelphia 1, Pa.
Attn: Requirements Control Office
Supply Division

Quartermaster Research and Engineering Center
U.S. Army
Natick, Mass.
Attn: Library

Quartermaster Research and Engineering Center
Clothing and Organic Materials Division
U.S. Army
Natick, Mass.

OTHERS

Naval Member
Canadian Joint Staff
2450 Massachusetts Ave., N.W.
Washington 8, D.C.

Defence Research Member
Canadian Joint Staff
2450 Massachusetts Ave., N.W.
Washington 8, D.C.

Office of Admiral (6 copies)
British Joint Services Mission
Post Office Box 165
Benjamin Franklin Station
Washington, D.C.

Exchange and Gift Division
The Library of Congress
Washington 25, D.C.
Attn: Exchange Section

Dr. C. J. Wessel
National Research Council
2101 Constitution Avenue
Washington, D.C.

Defence Research Medical Laboratories
P.O. Box 62, Post Station K
Toronto, Ontario, Canada
Attn: Dr. L. H. Turl

Directorate of Interservice
Development Department of National Defence
220 Wellington Street
Ottawa, Ontario, Canada
Attn: Mr. C. T. Holmes, Chief
Textile, Clothing and Footwear

Office of Technical Services
U.S. Department of Commerce
Washington 25, D.C.
Attn: Technical Reports Section

Naval Supply Research & Development Facility Clothing & Textile Div., Bayonne, N. J.

DEVELOPMENT OF 65% DACRON/35% VISCOSE TROPICAL FABRIC AND UNIFORM, by J. Steelman. February 1962. 22 p. tab. fig.

References: p. 22.

The development of a 65% Dacron 35% viscose rayon tropical fabric is described. Its general fabric properties, appearance retention and tailoring properties are compared to 100% wool tropical worsted and a previously developed 50% Dacron/50% viscose rayon tropical. Also discussed are patterns, components, and fabrication in relation to 65% Dacron/35% viscose tropical fabrics; related specifications; and initial procurement and issue of uniforms.

1. Synthetic textiles—Blends
2. Dacron textiles—Applications
3. Rayon textiles—Applications

I. Steelman, J.

II. Title

III. Task NT-FO15-14-004.03(4)

IV. C&T Report 55

Naval Supply Research & Development Facility Clothing & Textile Div., Bayonne, N. J.

DEVELOPMENT OF 65% DACRON/35% VISCOSE TROPICAL FABRIC AND UNIFORM, by J. Steelman. February 1962. 22 p. tab. fig.

References: p. 22.

The development of a 65% Dacron 35% viscose rayon tropical fabric is described. Its general fabric properties, appearance retention and tailoring properties are compared to 100% wool tropical worsted and a previously developed 50% Dacron/50% viscose rayon tropical. Also discussed are patterns, components, and fabrication in relation to 65% Dacron/35% viscose tropical fabrics; related specifications; and initial procurement and issue of uniforms.

1. Synthetic textiles—Blends
2. Dacron textiles—Applications
3. Rayon textiles—Applications

I. Steelman, J.

II. Title

III. Task NT-FO15-14-004.03(4)

IV. C&T Report 55

Naval Supply Research & Development Facility Clothing & Textile Div., Bayonne, N. J.

DEVELOPMENT OF 65% DACRON/35% VISCOSE TROPICAL FABRIC AND UNIFORM, by J. Steelman. February 1962. 22 p. tab. fig.

References: p. 22.

The development of a 65% Dacron 35% viscose rayon tropical fabric is described. Its general fabric properties, appearance retention and tailoring properties are compared to 100% wool tropical worsted and a previously developed 50% Dacron/50% viscose rayon tropical. Also discussed are patterns, components, and fabrication in relation to 65% Dacron/35% viscose tropical fabrics; related specifications; and initial procurement and issue of uniforms.

1. Synthetic textiles—Blends
2. Dacron textiles—Applications
3. Rayon textiles—Applications

I. Steelman, J.

II. Title

III. Task NT-FO15-14-004.03(4)

IV. C&T Report 55

Naval Supply Rescarch & Development Facility Clothing & Textile Div., Bayonne, N. J.

DEVELOPMENT OF 65% DACRON/35% VISCOSE TROPICAL FABRIC AND UNIFORM, by J. Steelman. February 1962. 22 p. tab. fig.

References: p. 22.

The development of a 65% Dacron 35% viscose rayon tropical fabric is described. Its general fabric properties, appearance retention and tailoring properties are compared to 100% wool tropical worsted and a previously developed 50% Dacron/50% viscose rayon tropical. Also discussed are patterns, components, and fabrication in relation to 65% Dacron/35% viscose tropical fabrics; related specifications; and initlal procurement and issue of uniforms.

1. Synthetic textiles—Blends
2. Dacron textiles—Applications
3. Rayon textiles—Applications

I. Steelman, J.

II. Title

III. Task NT-FO15-14-004.03(4)

IV. C&T Report 55

Naval Supply Research & Development Facility Clothing & Textile Div., Bayonne, N. J.

DEVELOPMENT OF 66% DACRON/36% VISCOSE TROPICAL FABRIC AND UNIFORM, by J. Steelman. February 1962. 22 p. tab. fig.

References: p. 22.

The development of a 65% Dacron 35% viscose rayon tropical fabric is described. Its general fabric properties, appearance retention and tailoring properties are compared to 100% wool tropical worsted and a previously developed 50% Dacron/50% viscose rayon tropical. Also discussed are patterns, components, and fabrication in relation to 65% Dacron/35% viscose tropical fabrics; related specifications; and initial procurement and issue of uniforms.

1. Synthetic textiles—Blends
2. Dacron textiles—Applications
3. Rayon textiles—Applications

I. Steelman, J.

II. Title

III. Task NT-FO15-14-004.03(4)

IV. C&T Report 55

Naval Supply Research & Development Facility Clothing & Textile Div., Bayonne, N. J.

DEVELOPMENT OF 66% DACRON/35% VISCOSE TROPICAL FABRIC AND UNIFORM, by J. Steelman. February 1962. 22 p. tab. fig.

References: p. 22.

The development of a 66% Dacron 36% viscose rayon tropical fabric is described. Its general fabric properties, appearance retention and tailoring properties are compared to 100% wool tropical worsted and a previously developed 50% Dacron/50% viscose rayon tropical. Also discussed are patterns, components, and fabrication in relation to 66% Dacron/36% viscose tropical fabrics; related specifications; and initial procurement and issue of uniforms.

1. Synthetic textiles—Blends
2. Dacron textiles—Applications
3. Rayon textiles—Applications

I. Steelman, J.

II. Title

III. Task NT-FO15-14-004.03(4)

IV. C&T Report 55

Naval Supply Research & Development Facility Clothing & Textile Div., Bayonne, N. J.

DEVELOPMENT OF 66% DACRON/36% VISCOSE TROPICAL FABRIC AND UNIFORM, by J. Steelman. February 1962. 22 p. tab. fig.

References: p. 22.

The development of a 66% Dacron 36% viscose rayon tropical fabric is described. Its general fabric properties, appearance retention and tailoring properties are compared to 100% wool tropical worsted and a previously developed 50% Dacron/60% viscose rayon tropical. Also discussed are patterns, components, and fabrication in relation to 65% Dacron/36% viscose tropical fabrics; related specifications; and initial procurement and issue of uniforms.

1. Synthetic textiles—Blends
2. Dacron textiles—Applications
3. Rayon textiles—Applications

I. Steelman, J.

II. Title

III. Task NT-FO16-14-004.03(4)

IV. C&T Report 66

Naval Supply Research & Development Facility Clothing & Textile Div., Bayonne, N. J.

DEVELOPMENT OF 65% DACRON/36% VISCOSE TROPICAL FABRIC AND UNIFORM, by J. Steelman. February 1962. 22 p. tab. fig.

References: p. 22.

The development of a 66% Dacron 36% viscose rayon tropical fabric is described. Its general fabric properties, appearance retention and tailoring properties are compared to 100% wool tropical worsted and a previously developed 50% Dacron/60% viscose rayon tropical. Also discussed are patterns, components, and fabrication in relation to 66% Dacron/36% viscose tropical fabrics; related specifications; and initial procurement and issue of uniforms.

1. Synthetic textiles—Blends
2. Dacron textiles—Applications
3. Rayon textiles—Applications

I. Steelman, J.

II. Title

III. Task NT-FO15-14-004.03(4)

IV. C&T Report 55